2e RENCONTRE INTERNATIONALE
SUR LE BIOMAGNETISME

(G r e n o b I e - F r a n c e - 1 9 7 8)

2nd International Workshop on Biomagnetism
(Grenoble – France – 1978)

Conference site:

Amphithéâtre Supérieur Nord
Faculté de Médecine de Grenoble La Tronche

Chairman of the Conference:

Professor M. TANCHE
Université Scientifique et Médicale de Grenoble

Co-Chairman:

Dr. D. MATELIN
Université Scientifique et Médicale de Grenoble

Under the patronage of

Professor G. CAU
President of l'Universite
Scientifique et Médicale de GrenobIe

2nd WORKSHOP ON BIOMAGNETISM
Grenoble (France) - 1978

Tμesday, August 29

18. 00 - 21. 30: Welcome cocktail

Wednesday, August 30

9. 00 – 9. 30 : Opening of the workshop

Professor M. TANCHE

Presentation of the workshop

D. MATELIN

9. 30 - 13. 00 : -Magnetic fields of the human brain

S. WILLIAMSON

-Comparison of MEG and EEG sensitivities

N. CUFFIN

- Measurement of direct current in the human body

D. COHEN

13. 00 - 14. 30 : Lunch break

14. 30 - 17. 00 - Magnetocardiography in weak DC ambient magnetic fields

N. TEPLEY

-Fetal magnetocardiography

V. KARINIEMI / T. E. KATILA

17. 00 - 17. 30 : Coffee break

17. 30 - 19. 30 : - On balancing superconducting gradiometers

P. KARP

- A simple second order gradiometer

G. STROINK

20. 30 : Dinner

Thursday, August 31

9. 00 - 13. 00 : - MCG in myocardial infarction

E. LEPESCHKIN

- Morphological analysis of the MCG

P. KARP

- Multipole Analysis of the MCG

T. VARPULA

- The magnetic heart beat (movie film)

The Helsinki Group

13. 00 – 14. 30 Lunch break

14. 30 - 17. 00 - Pacing of rabbit heart by rapidly varying electromagnetic fields

E. LEPESCHKIN

- Demonstration of MCG measurement in a hospital environment

D. MATELIN

17. 00 - 17. 00 Coffee break

17. 30 - 19. 00 - Magnetic noise in a hospital, laboratory and rural environment

M. L. KUUSELA

- DC and AC measurements in an unshielded, urban hospital setting

S. E. ROBINSON

19. 00 : Aperitive

19. 30 : Dinner (open)

Friday, September 1

9. 00 - 13. 00 : - Recent studies on pulmonary ferromagnetic contamination

K. AITTONIEMI

- Clearance measurement of magnetic dust from the human lung

S. ARAI

- Magnetopneumographic measurements on coal and asbestos workers

A. FREEDMAN

- A new approach to magnetopneumography - a practical inverse solution

S. E. ROBINSON

13. 00 - 14. 30 Lunch break

14. 30 – 17. 00 Closing discussion

3rd Workshop on Biomagnetism

Other subjects

It is expected that the talks will be very informal, and last about 30 min. There will be some time at the end of each talk for discussion and General discussions at the end of the sessions (Neuromagnetism, Cardiomagnetism, Pneumomagnetism, . . .).

NOTE ADDED in reconstructing the Conference program:
As typical for workshops, many ad hoc changes of the names and order of talks etc. took place during the actual meeting.
Comments and inclusions upon the program above are welcome.

Espoo March 6, 2018

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List of Participants to the
2nd Workshop on Biomagnetism (Grenoble 1978)

K. AITTONIEMI	(Finland)
S. ARAI	(Japan)
S. BARBANERA	(ltaly)
D. COHEN	(U. S. A.)
D. B. CRUM	(U. S. A.)
N. CUFFIN·	(U. S. A.)
DANCER	(France)
D. DURET	(France)
S. N. ERNE	(W. Germany)
A. FREEDMAN	(U. S. A.)
D. GESELOWITZ	(U. S. A.)
H. D. HAHLBOHM	(W. Germany)
M. HORACEK	(Canada)
H.P. JABLONSKI	(W. Germany)
P. KARP	(Finland)
T. KATILA	(Finland)
M. L. KUUSELA	(U. S. A.)
E. LEPESCHKIN	(Canada)
R. MACLEOD	(France)
D. MATELIN	(Netherlands)
M. PETERS	(France)
PUCK	(France)
RIEUX	(U. S. A.)
S. ROBINSON	(Italy)
G. L. ROMANI	(Canada)
G. STROINK	(U. S. A.)
N. TEPLEY	(France)
D. TESZNER	(Yugoslavia)
Z. TRONTELJ	(Finland)
T. VARPULA	(U. S. A.)
S. WILLIAMSON	(France)
D. ZENATTI	

ABSTRACTS INCLUDED IN THE CONFERENCE PROGRAMME

Comparison of MEG and EEG Sensitivities

Neil CUFFIN

A comparison of MEG and EEG sensitivities to sources on the brain's cortex is to be presented. This comparison is performed using computer modeling and a spherical model of the head that contains four regions that represent the brain, pia mater, skull and scalp. Lead fields produced on the cortical surface in the brain region by various types of unipolar, bipolar and quadrupolar MEG´s and EEG´s are calculated and compared. These comparisons show that unipolar MEG 1s and EEG 1s are sensitive to sources with different locations and orientations. Bipolar MEG1 s and EEG1 s are found to be sensitive to sources with similar locations and orientations. However, bipolar MEG1s detect a smaller area on the cortex ; the MEG sensitivity decreases approximately twice as rapidly with distance as that of the EEG.. This is because potentials measured by the EEG are "smeared" by the inhomogeneous layers surrounding the brain ; the magnetic fields measured by the MEG are not subject to such "smearing". The response of bipolar MEG's and EEG1s to aligned and randomly oriented sources on the cortex are calculated and it is found that for the aligned source the MEG detects.. an area which is approximately 0.3 that of the EEG ; for the random source the ratio is approximately 0.4. The quadrupolar MEG and EEG sensitivities are found to be approximately equal. Calculations are also performed which show that the advantage of bipolar MEG measurements can be expected when practical MEG detectors are used.

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MAGNETOCARDIOGRAPHY IN WEAK DC AMBIENT MAGNETIC FIELDS*

G. Boismier, L. Hlatky** and N. Tepley, Department of Physics, Oakland University, Rochester, Michigan U.S.A.

Magnetocardiograms measured in weak, uniform DC magnetic fields contain a component arising from blood flow as well as the well known component arising from the heart's electrical activity. A derivation of this effect from Maxwell 's equations leads to a fundamentally different description than the one predicted by Wikswo and coworkers[1] but consistent with ventricular stroke volume as deduced from the data. Measurements on model ventricles and human subjects demonstrate the effect.

[1]J. P. Wikswo, Jr., J. E. Opfer, and W. M. Fairbank, Proc. 19th Ann. Conf. on Magnetism and Magnetic Materials, C. D. Graham and J. J. Rhyne, eds. (Am. Inst. of Phys., N.Y. 1974) pp. 1335-1339.

*Research supported by grants from the Michigan Heart Association.

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A Simple Second Order Gradiometer

G. Stroink, B. L. Blackford and M. Horacek

Abstract

A-superconducting second order gradiometer of a simple design, used for biomagnetic studies, is described. The coils of the gradiometer can be balanced to approximately 1:10^3 with rods extending from the gradiometer to outside the cryostat.
The output of the gradiometer is connected to a commercial SQUID system. Outside the city the measured noise level of the gradiometer output in a 0 - 100 Hz bandwidth is 1 pT/SQRT(Hz). The probe has been used to measure MCG's, as well as the F.C. of lungs of coal miners and steel workers. Some of the results will be presented. At the moment a shielded 3/4" aluminum room of 12 ft, X 8 ft. X 8 ft. is being constructed. The shielding factors of such a room will be discussed.

Magnetopneumographic Measurements on Coal Workers

Allan P. Freedman, M.O.*, Stephen E. Robinson, Ph .. D.*, Robert F. Johnston, M.D.*; and Francis H.Y. Green**

Magnetopneumography (MPG) was used to measure the quantity and dlstribution of occupationally acquired lung dust in 16 active bituminous coal workers, 22 disabled miners, and 14 rural control subjects. The trace ferrimagnetic mineral fraction of the pulmonary dust was detected at 17 representative uniform magnetization in an external field. A constant derived from from measurements of the fraction of ferrimagnetic mineral in coal mine dust within the respirable range was used to convert the MPG scan measurements into equivalent lung dust concentrations on a regional basis. Three active miners had significantly higher calculated lung dust levels than did other active miners ($p < 0.005$) and control subjects ($p < 0.005$), yet could not be otherwise differentiated by work history, spirometry, or chest roentgenograms. The disabled miners had higher lung dust levels than did the controls ($p<00.5$) of most active miners. A pattern of hilar concentration was noted in both retired and active miners having elevated lung dust levels. The pattern of dust deposition is being studied with higher resolution in freeze-dried autopsied lungs of coal workers using a stereotaxic lung holder for whole lungs and lung slices followed by stereologic scanning analysis of component lung slices. Our data suggests that the MPG scan may be useful in the study of lung dust accumulation and clearance in coal miners, and in clarifying the relationship of lung dust the development of coal workers' pneumoconiosis.

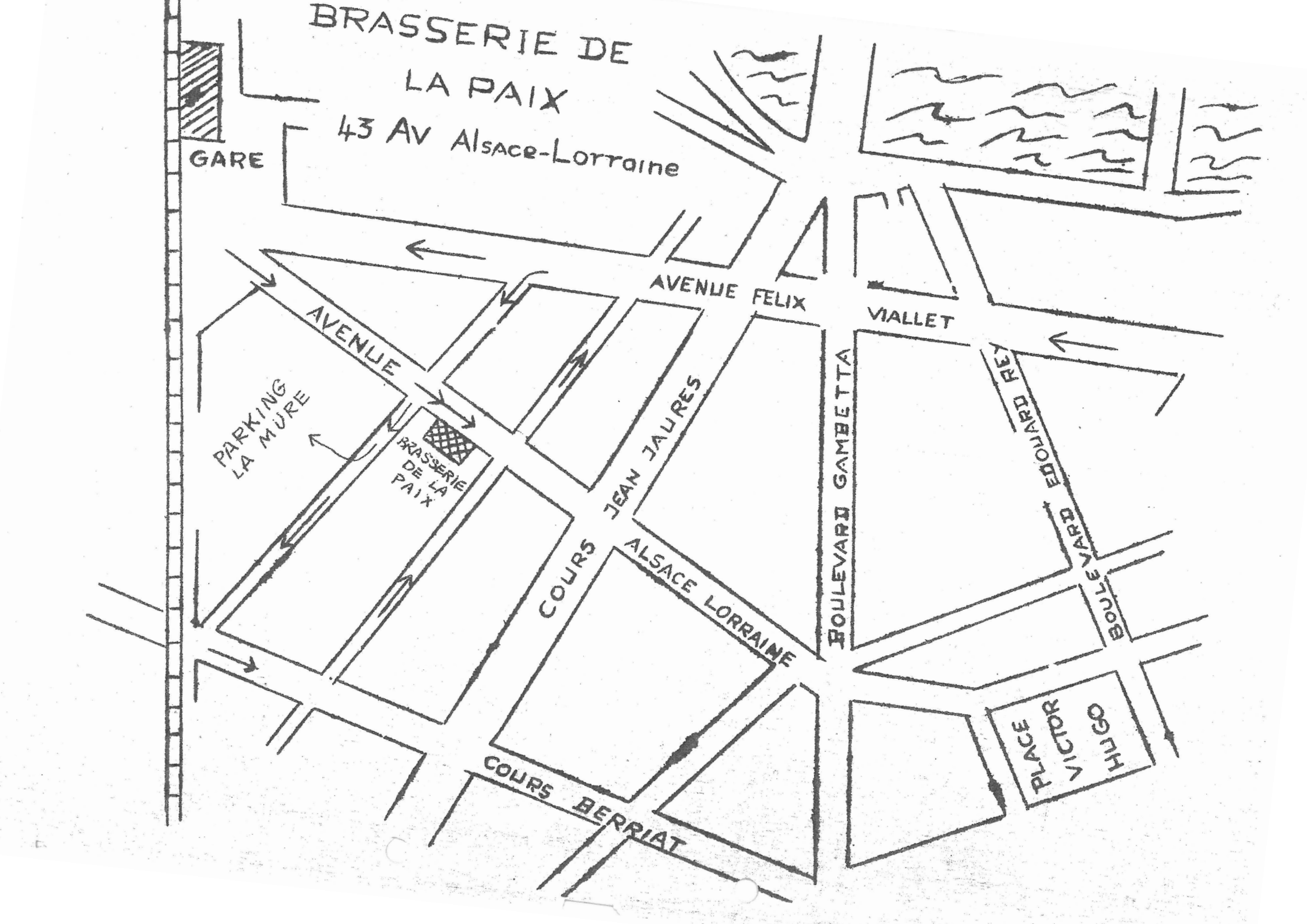
This study was supported by Contract #493720 of the Division of Chronic Respiratory and Occupational Disease Services of the State of Pennsylvania.

*Hahneman nMedical College and Hospital
**Appalachian Laboratory for Occupational Safety and Health

A New Approach To Magnetopneumography

Stephen E. Robinson, Ph.D. and Allan P. Freedman, M.D.
Hahnemann Medical College and Hospital

Current magnetopneumographic techniques are based upon magnetization of the entire thorax with a uniform field generated by large Helmholtz coils. After magnetization in a uniform field, a body containing an inhomogeneous distribution of magnetizable particles will retain a complex field which does not readily lend itself to an inverse solution .. If the small region of space that is seen by the gradiometer probe corresponded closely with a restricted region that is magnetized, and surrounding regions were not magnetized, then the output of the gradiometer would be directly proportional to the concentration of magnetic mineral within its field of view. Under these conditions, the measured retained field would not be distorted by outlying inhomogeneities, and inhomogeneity within the region magnetized would be minimal because of the smaller volume sampled by the probe. This technique could be implemented by incorporating a small magnetizing coil coaxially with the gradiometer probe. The measuring sequence at each point for the MPG scan would then be: (1) local magnetization, (2) retained field measurement, (3). reverse polarity local magnetization, (4) second retained field measurement, (5) local demagnetization. This procedure allows direct inverse solution of regional concentration of magnetic mineral, and eliminates interference due to extrathoracic metallic foreign bodies. Use of a smaller magnetizing coil would also make it practical to generate larger applied fields because of reduced power comsumption, and the lack of uniformity of applied magnetic field from a single small magnetizing coil would only effect the constant of proportionality. Also any measurement error due to the "relaxation" phenomena would be effectively eliminated.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